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The curvilinear effects of sexual orientation on young adult substance use

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HIGHLIGHTS

- Sexual orientation was studied as a continuous, not categorical, variable.
- Mixed orientation women report higher substance use than exclusively hetero or homosexual women.
- Mixed orientation men report higher marijuana use than exclusively hetero or homosexual men.

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ABSTRACT

Alcohol, tobacco, and marijuana are commonly used by adolescents and linked with harmful health-related outcomes (e.g. injury, dependence). Moreover, heavy episodic (binge) drinking predicts more severe consequences. When examined by sexual orientation, highest rates of substance use have been found among bisexual individuals, with lower use at either end of the spectrum. When examined also by sex, this curvilinear trend is maintained among women but not men. These substance use patterns were identified using group differences (i.e. heterosexual vs. bisexual vs. homosexual). However, evidence suggests that sexual orientation is a continuous, not categorical, variable. This study examined the hypotheses that sexual orientation and commonly used substances (heavy episodic drinking, tobacco, marijuana) would have a quadratic relation among women, but not among men. Six negative binomial regressions tested study hypotheses using data from 7372 participants. Results indicated that sexual orientation had a quadratic relation with heavy episodic drinking, tobacco use, and marijuana use among women, as hypothesized. Additionally, a quadratic relation was found between marijuana use and sexual orientation among men. These findings indicate that women identifying as having mixed sexual orientation are at higher risk than women at either end of the sexual orientation continuum for substance use and related negative outcomes. For men, this is only true for marijuana use and resultant negative consequences. This observed increased use may relate to coping with increased stressors, which has been linked to more problematic use. By better understanding LBG identities and behaviors, clinicians and researchers will be more adept at identifying risk factors and better understanding the nuances across the sexual orientation spectrum.

Substance use is common among young adults, including college students (Substance Abuse and Mental Health Services Administration [SAMHSA], 2015). Of students 18 to 22, 21% report having used tobacco in the past month, 59.4% having used alcohol, with 39% reported of those reporting heavy episodic, or binge, drinking, and 19.4% having used marijuana (SAMHSA, 2015; Suerken et al., 2015). Alcohol use, both casual and binging, is higher among college students than their non-student, same-aged peers (SAMHSA, 2015). Engagement in substance use is linked to a number of risky behaviors and negative outcomes. Cigarette smoking is associated with numerous health issues and illnesses (Centers for Disease Control and Prevention, 2008). Alcohol use, particularly heavy episodic drinking, is related to academic, legal, physical and mental health problems, including unintended injury or death, risky sexual encounters, unsafe driving, and other regretted behaviors (Vicary & Karshin, 2002). Marijuana use influences impaired judgment and memory, increased likelihood of engaging in risky behaviors, and unintended injury (Volkow, Baler, Compton, & Weiss, 2014). Further, dependence on any of these substances poses increased risks of use and negative outcomes.

Among lesbian, gay, and bisexual (LGB) adolescents there are higher reported substance use and related disorders compared to their heterosexual peers (Marshal et al., 2008). When examined by sexual orientation, college students who identify as bisexual are more likely to engage in risky behaviors, such as drug use or non-suicidal self-injury, than their homosexual or heterosexual counterparts (Benau, Jenkins, & Conner, 2016; Ford & Jasinski, 2006). This quadratic relation, where use at the "center" of the sexual orientation continuum, bisexual, is

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higher than at its ends, hetero- or homosexual, is seen in alcohol, tobacco, and marijuana use (Coker, Austin, & Schuster, 2010; Eisenberg & Wechsler, 2003; Ford & Jasinski, 2006; Trocki, Drabble, & Midanik, 2009). However, though generally upholding a quadratic trend, the exact relations become inconsistent when broken down by sex.

Lesbian women report more frequent heavy drinking episodes than heterosexual women, while bisexual women consistently report more episodes than both lesbian and heterosexual women (Coker et al., 2010; Eisenberg & Wechsler, 2003; Trocki et al., 2009). However, this relation differs for men, as bisexual and gay men report less heavy episodic drinking than heterosexual men (Eisenberg & Wechsler, 2003). Yet, this finding is also inconsistent, as Coker et al. (2010) found that bisexual men binge drink more than heterosexual men. Concerning tobacco use among women, a quadratic relation of use by sexual orientation mirrors that of binge drinking. Among men, some studies have found that those identifying as bisexual may use more tobacco than heterosexual and gay men (Coker et al., 2010), while other studies have found nonsignificant differences in men's tobacco use by sexual orientation (e.g. Eisenberg & Wechsler, 2003; Trocki et al., 2009). Regarding marijuana, results for women have consistently shown higher use among bisexual women than lesbian or heterosexual women, with heterosexual women often reporting less use than lesbian women (Eisenberg & Wechsler, 2003; Ford & Jasinski, 2006; Trocki et al., 2009). Male marijuana use by sexual orientation has mixed findings, with results indicating higher, lower, or nonsignificant differences between gay, bisexual, and heterosexual use.

Potential reasons for increased substance use in LGB individuals are varied. LGB individuals face unique environmental stressors, such as homophobia and discrimination (Hatzenbuehler, 2009). LGB individuals also experience higher rates of victimization and abuse. These stressors may create internalized homophobia, confusion, depression, anxiety, and other difficulties (Eisenberg & Wechsler, 2003). This may be exacerbated for bisexual individuals as they may face stigma from both heterosexual and homosexual peers. Increased substance use may occur as a coping mechanism for the aforementioned life stressors. Using drugs to cope strongly predicts substance dependence and other life problems (Cooper, Russell, & George, 1988). Alternatively, LGB individuals may be more open to experiences, as evidenced by more sexual exploration and experimentation (Eisenberg & Wechsler, 2003).

When comparing male and female past month heavy episodic drinking (15.4%, 12.1%), marijuana use (10.9%, 6.0%), and tobacco use (31.1%, 19.7%) frequencies, rates of use are notably higher among men (SAMHSA, 2015). Similarly, research has found higher rates of dependence for all three aforementioned substances among males (Anthony, Warner, & Kessler, 1994; Brady & Randall, 1999). Since men are more likely to use drugs, there may be more factors influencing use among men than among women. Therefore, the influence of sexual orientation may account for less variance explaining substance use among men. Moreover, women more often report using substances to cope with stress (Brady & Randall, 1999). Since bisexual women may be experiencing unique stressors beyond those of other women (e.g. biphobia), using substances to cope may account for some of the quadratic relation. Furthermore, using drugs to cope with stress may reinforce habitual use (Cooper et al., 1988), thus strengthening the quadratic trend.

As findings relating substance use, sex, and sexual orientation have been inconsistent (e.g. alcohol use in gay men), further exploration into this topic will help clarify the nature of these relations. Additionally, past research has examined these relations by group differences (i.e. heterosexual vs. bisexual vs. homosexual), which limits both the recognition and influence of the diversity of sexual orientation identities. Kinsey, Pomeroy, and Martin (1948) supported that sexual orientation may best be represented in a continuous manner. Subsequent research has shown that measuring sexual orientation on a continuum allows for a better understanding of how orientation and attraction operate and influence decision making (Vrangalova & Savin-Williams, 2012). However, there have yet to be studies examining substance use using a continuous sexual orientation scale. As alcohol, tobacco, and marijuana are the three most commonly used substances, investigating their use with this more nuanced approach may provide findings that are the most generalizable (SAMHSA, 2015). It was hypothesized that among women, a quadratic relation would be upheld between sexual orientation and use of each substance, with highest use among individuals with a mixed sexual orientation. However, it was hypothesized that for men, nonsignificant relations would be found between sexual orientation and substance use.

1. Methods

1.1. Participants and procedures

Undergraduate college students ($N = 7372$) at a Colorado and a Pennsylvania university completed a survey as part of a study on personality and health risk behaviors. Participants were recruited from psychology courses and participated in exchange for research credit. The survey was either taken online or in a computer lab. If participants completed the survey in the lab, they were given cubicles to help ensure privacy and encouraged to respond honestly. Participants were all over 18 years of age ($M = 20.16$, $SD = 2.99$), 65.9% female, 10.7% Hispanic, 63.5% White/European American, 29.6% multiracial, and 9.6% identifying as other races. Full demographic data are presented in Table 1. This study received IRB approval from both institutions.

1.2. Measures

Sexual orientation was assessed using both a 7-point scale and an open-ended self-report question. The scale ranged from 1, indicating exclusively gay or lesbian, to 7, indicating exclusively heterosexual, with an internal anchor 4, indicating being bisexual ($M = 6.55$, $SD = 1.19$). For men, $M = 6.63$ ($SD = 1.18$), and for women, $M = 6.51$ ($SD = 1.19$). It also included the option to "Prefer not to respond" ($N = 17$). This scale, based on Kinsey et al. (1948), allows for more variance than a categorical or dichotomous measure, allowing participants to more accurately describe their sexual orientation. Research has also shown that this method of assessment is preferred by participants (Drucker, 2012; Korchmaros, Powell, & Stevens, 2013). The open-ended item allowed participants to enter how they identify their sexual orientation without being restricted to pre-defined categories (i.e., heterosexual, bisexual, homosexual) that limit variability and force definitions that some may not agree with (Korchmaros et al., 2013).

Heavy episodic drinking, tobacco, and marijuana use were assessed through the Risky Behaviors Inventory (RBI; Conner & Henson, 2013). The RBI contains questions wherein participants indicate whether they have ever engaged in a behavior and, if endorsed, how often and to what extent they engage in said risky behavior. Heavy episodic drinking, defined as four or more standard drinks for women or five or more standard drinks for men in one occasion (SAMHSA, 2015), was assessed by asking frequency of heavy episodic drinking in the past 30 days. For

Table 1
Demographic statistics.

Sex %	Age	Race %	Ethnicity %
Female = 65.9 Male = 34.1	$M = 20.61$ $SD = 2.99$	American Indian = 0.7 Asian/Asian American = 3.1 Black/African American = 3.0 Native Hawaiian/Pacific Islander = 0.2 White/European American = 63.5 Multiracial = 26.9 DNR = 2.6	Hispanic/Latino = 10.7 Non-Hispanic/Latino = 84.0 DNR = 5.2

Note: $N = 7372$.

tobacco and marijuana use, participants were asked how many times in the past 30 days they had used the substance. Substance use frequencies are presented in Table 2.

1.3. Analysis

Participants who did not complete the relevant RBI sections had their data removed ($N = 92$). Any unquantifiable responses for substance use (e.g. "many times") were removed ($N = 74$). Sexual orientation ratings on the 7-point scale were compared to open-ended responses to identify discrepancies. Opposing responses ($N = 265$), indicating an answer towards one end of the continuum (i.e., indicating a 1 or a 2) and then writing in an opposing orientation (coded as 6 or 7) were reversed (i.e. a 1 to a 7, 2 to a 6…). Only responses that were clearly opposing were recoded, while other responses, such as "asexual" or "pansexual", were left unchanged. Additionally, most participants who identified as asexual, pansexual, or similar endorsed "Prefer not to respond". All participants who preferred not to respond were excluded from analysis. χ^2 was used to test for differences between the number of recoded responses by administration setting (i.e., lab or online). χ^2 was also used to test for differences in substance use prevalence at each university. As the dependent variables were count-distributed and had variances that were greater than means, the moderating effects of sexual orientation on substance use was tested using negative binomial regression (Holsclaw, Hallgren, Steyvers, Smyth, & Atkins, 2015). The continuous numerical sexual orientation (SO) variable was regressed on past 30-day of heavy episodic drinking occurrences, tobacco use, and marijuana use. Due to hypothesizing a quadratic relation between sexual orientation and substance use, a quadratic term was created for sexual orientation by squaring the sexual orientation variable. The quadratic term (SO^2) was then also regressed on the same variables in the same regression equation as previously mentioned to assess for a curvilinear relation. Six separate regressions were run examining each substance by male and female participants. All statistical analyses were conducted using SPSS 23.0 (IBM, 2015) with alpha set to 0.05.

2. Results

Descriptive analyses indicated that 54% of the sample reported heavy episodic drinking in the past 30 days, while 13.6% reported tobacco use and 29.9% reported marijuana use in that same time frame. The means and standard deviations for substance use frequencies are presented in Table 2. Results from the χ^2 comparing proportion of recoded sexual orientation responses by for online (6.3%) versus lab (4.0%) setting was significant, $\chi^2 = 12.23$, $df = 1$, $p < 0.001$. χ^2 results revealed a higher prevalence of heavy episodic drinking ($\chi^2 = 41.196$, $df = 1$, $p < 0.001$), tobacco use ($\chi^2 = 505.615$, $df = 1$, $p < 0.001$), and marijuana use ($\chi^2 = 5.162$, $df = 1$, $p < 0.05$) in the Pennsylvania sample.

The negative binomial regressions for heavy episodic drinking were significant for both men, $\chi^2 = 9.41$, $df = 2$, $p < 0.01$, and women, $\chi^2 = 27.11$, $df = 2$, $p < 0.001$. For men, neither of the direct effects of SO or SO^2 were significant, however for women, both the SO and SO^2 term had significant direct effects on heavy episodic drinking (see Table 3). Results from the regressions are plotted in Fig. 1, which indicate a curvilinear relation between sexual orientation and heavy episodic drinking for women. Specifically, highest use was found among those endorsing neither an exclusively heterosexual nor exclusively homosexual orientation, hereafter referred to as mixed sexual orientation, with less use at either end of the continuum. These findings support the hypothesis that sexual orientation predicting heavy episodic drinking would have a quadratic relation for women and a non-significant relation for men.

Table 2
Substance use past month means and standard deviations.

Sex	Heavy episodic drinking M (SD)	Tobacco M (SD)	Marijuana M (SD)
Male	3.23 (4.28)	8.99 (54.41)	7.71 (21.87)
Female	2.42 (3.83)	6.64 (76.87)	3.31 (12.70)

Note: Male $N = 2511$, Female $N = 4852$.

Table 3
Heavy episodic drinking negative binomial regression results.

	β	SE	95% Wald CI	Wald χ^2	*p*
Men					
Intercept	0.697	0.284	0.121, 1.154	8.567	<0.05
SO	0.115	0.148	−0.163, 0.436	0.827	0.437
SO^2	−0.006	0.016	−0.040, 0.026	0.159	0.743
Women					
Intercept	0.241	0.257	−0.283, 0.724	2.143	0.347
SO	0.393	0.106	0.184, 0.605	26.087	<0.01
SO^2	−0.043	0.011	−0.065, −0.022	26.976	<0.01

Note: sexual orientation (SO), and sexual orientation quadratic term (SO^2). Results estimated using bootstrapping.

The negative binomial regressions for tobacco use were significant for men, $\chi^2 = 47.878$, $df = 2$, $p < 0.001$, and women, $\chi^2 = 367.819$, $df = 2$, $p < 0.001$. Once again, for men, neither of the direct effects of SO or SO^2 were significant, while for women, the SO^2, but not the SO, term was significant (see Table 4). Regression results, graphed in Fig. 2, indicate a quadratic relation between sexual orientation and tobacco use for women. Highest use was found among women self-reporting a mixed sexual orientation, with use decreasing towards each end of the continuum. These findings support the hypothesis that tobacco use would exhibit a quadratic relation with sexual orientation for women only.

Finally, the negative binomial regression results for marijuana use were significant for both men, $\chi^2 = 106.506$, $df = 2$, $p < 0.001$, and women, $\chi^2 = 620.553$, $df = 2$, $p < 0.001$. The direct effects of the SO and SO^2 terms were significant for both men and women (see Table 5). As demonstrated in Fig. 3, results indicate that a curvilinear relation exists between sexual orientation and marijuana use for both sexes. For both men and women, highest use was found among individuals self-reporting mixed sexual orientation, with lower use at the continuum ends. This does not support the hypothesis that the quadratic relation between sexual orientation and marijuana use would only be significant for women.

3. Discussion

The present study examined relations between sexual orientation and alcohol, tobacco, and marijuana use among men and women. Analyses clarified the nature of these relations by assessing sexual orientation across a continuum, and looking at results separately for men and women. Results indicated that for women, a quadratic relation exists between sexual orientation and alcohol, tobacco, and marijuana use, wherein women with a mixed sexual orientation use all three substances more frequently than women on the heterosexual or homosexual end of the continuum, as hypothesized. Among men, this relation was identified in marijuana, but not tobacco or alcohol, use. This finding contradicted the hypothesis, resulting from previous research findings (Ford & Jasinski, 2006) that quadratic relations would not exist between sexual orientation and alcohol, tobacco, and marijuana use in men.

When examining the figures, it appears that, for heavy episodic drinking among women, women with a mixed sexual orientation reported higher frequency while lesbian women reported lower frequency, with the highest point being among those reporting a mixed orientation. While these relations were not tested statistically, this supports past findings that have found similar trends of highest frequency of binge drinking among bisexual women (e.g. Coker et al., 2010).

When examining the figure for tobacco use, a similar pattern was found among women, with the highest peak of the curve at the center

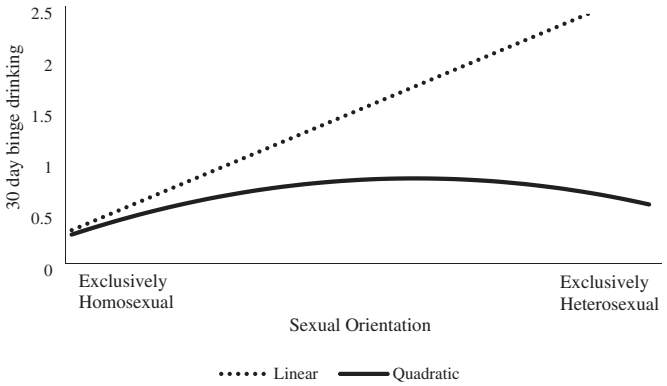

Fig. 1. The direct effects of SO an SO^2 on heavy episodic drinking among women. *Note:* As past 30 day binge drinking was log transformed, data for plotting are based on parameter estimates not actual binge drinking.

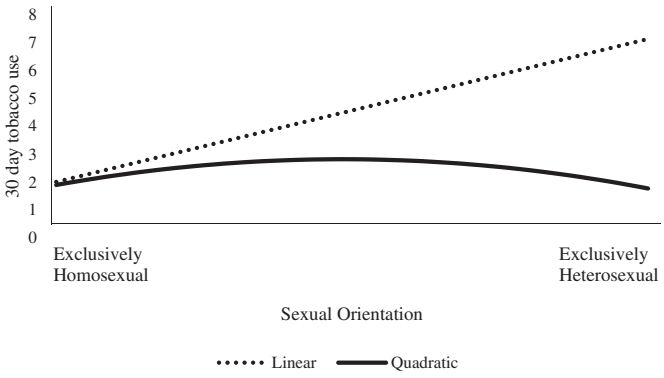

Fig. 2. The direct effects of SO an SO^2 on tobacco use among women. *Note*: As past 30 day tobacco use was log transformed, data for plotting are based on parameter estimates not actual use.

of the curve. While this was not tested statistically, some conclusions can be drawn. For tobacco, there may be decreased use among heterosexual women due to social norms disapproving of use among women (Nichter et al., 2006). Additionally, desire to reduce negative affect is a strong motivator of tobacco use among women (Livson & Leino, 1988). Since lesbian and bisexual women experience stressors unique from those of heterosexual women (e.g. homophobia), with bisexual women facing added stressors (i.e. biphobia; Eisenberg & Wechsler, 2003), these women may experience more frequent negative affect. Desire to reduce negative affect may explain why there is much more tobacco use among women with mixed sexual orientation.

Quadratic relations between sexual orientation and marijuana use were found for both men and women. Among women, use peaked at the mixed orientation center, with lower and fairly equivalent use at either end of the continuum. This finding supports past research that found a similar trend, but diverges from some studies that found lowest use among heterosexual women. While the curvilinear trend is generally consistent with past research, it contradicts findings that straight women may use less than lesbian women. The findings in this study may reflect increasing perceived acceptability of using marijuana (Berg et al., 2015; Schuermeyer et al., 2014), with straight women feeling less pressure to abstain.

For men, marijuana use also peaked among those reporting a mixed sexual orientation. However, male marijuana use was much lower at the gay end of the continuum compared to the heterosexual end of the continuum. This adds to the mixed findings regarding male sexual orientation and marijuana use, adding support for a curvilinear relation. Since men use more marijuana in general, it is possible that increased use among heterosexual men reflects increases in social acceptance (Berg et al., 2015; Schuermeyer et al., 2014). As factors influencing abstinence from marijuana use decrease, other factors may increase rates of use.

There are several limitations to consider regarding this study. First, more online than in lab respondents had sexual orientation scores recoded, indicating online participants may have made more errors in responding. Second, data were collected in Pennsylvania and Colorado, which have different marijuana legislation. This may have influenced use patterns in each area differently. Similarly, higher prevalence of use for all 3 substances was found in the Pennsylvania sample, which may reflect different motivations for use. However, it should be noted that significant effects in the combined sample were tested in the separate State samples and all effects remained significant and in the same direction in both State samples. Additionally, due to the cross-sectional nature of the data and the lack of experimental design, no causal statements can be made explaining the patterns in substance use by sexual orientation. Finally, this study intends to generalize to adolescent and young adult college going individuals, however behavior in other groups may differ.

The overall implication from this study is that women who identify with a mixed orientation may generally be at increased risk for substance use and related adverse outcomes compared to other women. Results also indicate this trend exists among male marijuana users, where men with a mixed orientation are at higher risk for use. Increased substance use in this population may be reflective of both unique stressors (i.e. biphobia) as well as more openness to experiences found in mixed sexual orientations. Subsequently, these individuals also may experience more negative consequences of substance use, particularly if used as a coping mechanism. Conversely, this pattern of use did not emerge among men for heavy episodic drinking and tobacco use. This indicates that other factors beyond sexual orientation are more influential to male heavy episodic drinking and tobacco use.

Another implication of this study includes the importance of not using a categorical approach to identifying participants' sexual orientation. While some past studies compare heterosexual to non-heterosexual individuals, this study found the non-heterosexual population to have heterogeneous substance use patterns. Moreover, results indicated

Table 4
Tobacco use negative binomial regression results.

	β	SE	95% Wald CI	Wald χ^2	*p*
Men					
Intercept	2.707	0.891	0.564, 4.157	212.975	<0.01
SO	0.101	0.474	−0.828, 1.047	0.936	0.810
SO^2	−0.025	0.053	−0.119, 0.081	4.322	0.615
Women					
Intercept	1.160	0.861	−0.809, 2.584	66.582	0.162
SO	0.851	0.477	−0.069, 1.866	156.125	0.076
SO^2	−0.109	0.055	−0.221, −0.003	218.913	<0.05

Note: sexual orientation (SO), and sexual orientation quadratic term (SO^2). Results estimated using bootstrapping.

Table 5
Marijuana use negative binomial regression results.

	β	SE	95% Wald CI	Wald χ^2	*p*
Men					
Intercept	−0.454	0.595	−1.907, 0.498	3.790	0.407
SO	1.207	0.265	0.728, 1.809	100.318	<0.01
SO^2	−0.121	0.027	−0.181, −0.067	83.807	<0.01
Women					
Intercept	−0.148	0.355	−0.938, 0.447	0.907	0.677
SO	1.242	0.171	0.932, 1.609	289.912	<0.01
SO^2	−0.155	0.019	−0.194, −0.118	391.566	<0.01

Note: sexual orientation (SO), and sexual orientation quadratic term (SO^2). Results estimated using bootstrapping.

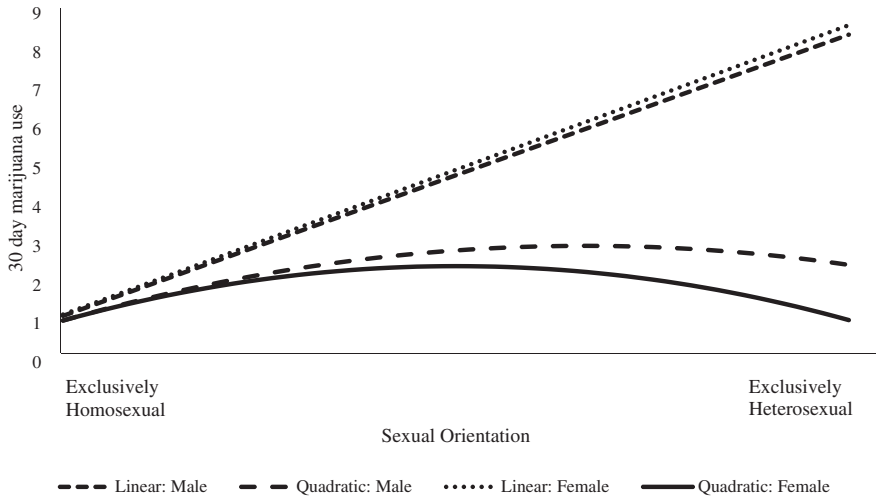

Fig. 3. The direct effects of SO an SO^2 on marijuana use. *Note*: As past 30 day marijuana use was log transformed, data for plotting are based on parameter estimates not actual use.

nuanced differences across the continuum of sexual orientation identities. By comparing groups rather than using a continuum of sexual orientation identities, studies risk overgeneralizing results, researchers may make inaccurate conclusions, and individuals may feel misrepresented or feel limited in how they report their sexual orientation identities. Therefore, it is important that sexual orientation be measured as continuous, not categorical.

Future directions of research include measuring substance use motives by sexual orientation. Motives for substance use may include coping, such as with mental health symptoms and victimization related to sexual minority identity, and peer influence (Cooper et al., 1988; Dermody, Marshal, Burton, & Chisolm, 2016; Eisenberg & Wechsler, 2003; Hatzenbuehler, 2009). Individuals who identify as a sexual minority are at risk for experiencing discrimination, abuse, and victimization resulting from homophobia or biphobia. As a group, sexual minorities experience higher rates of depression and anxiety (Eisenberg & Wechsler, 2003; Hatzenbuehler, 2009). Substance use may help individuals cope with the negative effects of harmful environments and mental health symptoms. Individuals who identify as bisexual, or with a mixed sexual orientation in our study, may experience discrimination or rejection from both the straight and gay or lesbian communities, which may increase the need for coping. Additionally, further exploration of motives should examine the impact of peer influence on substance use. For example, among adolescent males and females identifying with a sexual minority identity, heavy episodic drinking was predicted by peer substance use and victimization related to sexual minority status, but not an interaction between peer use and experiences of victimization. This suggests that the effects of peer influence on substance use may be distinct from use related to experiences of victimization (Dermody et al., 2016). Examination of how motives vary by sexual orientation using a continuum to measure sexual orientation identity may more sensitively identify the effects of these motives on substance use. In addition to motives, the consequences of substance use by sexual orientation identity should be studied. Other future research should examine why sexual orientation appears to influence female substance use more than male use.

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Contributors

Authors JEP and BTC designed the study and all authors helped collect data. JEP conducted literature searches, ran the statistical analysis and wrote the first manuscript draft. All authors edited, contributed to, and approved of the final manuscript.

Conflict of interest

All authors declare that they have no conflicts of interest.

References

Anthony, J. C., Warner, L. A., & Kessler, R. C. (1994). Comparative epidemiology of dependence on tobacco, alcohol, controlled substances, and inhalants: Basic findings from the national comorbidity survey. *Experimental and Clinical Psychopharmacology, 2*(3), 244–268.

Benau, E. M., Jenkins, A. L., & Conner, B. T. (2016). Perceived parental monitoring and sexual orientation moderate lifetime acts of non-suicidal self-injury. *Archives of Suicide Research*, 1–19 (2016 May 2) 10.1080/13811118.2016.1182092

Berg, C. L., Stratton, E., Schauer, G. L., Lewis, M., Wang, Y., Windle, M., & Kegler, M. (2015). Perceived harm, addictiveness, and social acceptability of tobacco products and marijuana among young adults: Marijuana, hookah, and electronic cigarette win. *Substance Use & Misuse*, *50*(1), 79–89. http://dx.doi.org/10.3109/10826084.2014.958857.

Brady, K. T., & Randall, C. L. (1999). Gender differences in substance use disorders. *Addictive Disorders*, *22*(2), 241–252.

Centers for Disease Control and Prevention (2008). Smoking-attributable mortality, years of potential life lost, and productivity losses—United States, 2000–2004. *MMWR. Morbidity and Mortality Weekly Report*, *57*, 1226–1228 (Retrieved from http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5745a3.htm).

Coker, T. R., Austin, S. B., & Schuster, M. a. (2010). The health and health care of lesbian, gay, and bisexual adolescents. *Annual Review of Public Health*, *31*, 457–477. http://dx.doi.org/10.1146/annurev.publhealth.012809.103636.

Conner, B. T., & Henson, J. M. (2013). *Development of the risky behavior inventory.* (Manuscript in preparation).

Cooper, M. L., Russell, M., & George, W. H. (1988). Coping, expectancies, and alcohol abuse: A test of social learning formulations. *Journal of Abnormal Psychology*, *97*(2), 218–230. http://dx.doi.org/10.1037/0021-843X.97.2.218.

Dermody, S. S., Marshal, M. P., Burton, C. M., & Chisolm, D. J. (2016). Risk of heavy drinking among sexual minority adolescents: Indirect pathways through sexual orientation-related victimization and affiliation with substance-using peers. *Addiction*, *111*(9), 1599–1606. http://dx.doi.org/10.1111/add.13409.

Drucker, D. J. (2012). Marking sexuality from 0 to 6: The Kinsey scale in online culture. *Sexuality and Culture*, *16*(3), 241–262. http://dx.doi.org/10.1007/s12119-011-9122-1.

Eisenberg, M., & Wechsler, H. (2003). Substance use behaviors among college students with same-sex and opposite-sex experience: Results from a national study. *Addictive Behaviors*, *28*, 899–913. http://dx.doi.org/10.1016/S0306-4603(01)00286-6.

Ford, J. A., & Jasinski, J. L. (2006). Sexual orientation and substance use among college students. *Addictive Behaviors*, *31*, 404–413. http://dx.doi.org/10.1016/j.addbeh.2005.05.019.

Hatzenbuehler, M. L. (2009). How does sexual minority stigma "get under the skin"? A psychological mediation framework. *Psychological Bulletin*, *135*(5), 707–730. http://dx.doi.org/10.1037/a0016441.

Holsclaw, T., Hallgren, K. A., Steyvers, M., Smyth, P., & Atkins, D. C. (2015). Measurement error and outcome distributions: Methodological issues in regression analyses of behavioral coding data. *Psychology of Addictive Behaviors*, *29*(4), 1031.

IBM Corp (Released 2015). *IBM SPSS statistics for windows, version 23.0.* Armonk, NY: IBM Corp.

Kinsey, A. C., Pomeroy, W. B., & Martin, C. E. (1948). *Sexual behavior in the human male.* Philadelphia, PA: W.B. Saunders Company.

Korchmaros, J. D., Powell, C., & Stevens, S. (2013). Chasing sexual orientation: A comparison of commonly used single-indicator measures of sexual orientation. *Journal of Homosexuality*, *60*(4), 596–614. http://dx.doi.org/10.1080/00918369.2013.760324.

Livson, N., & Leino, E. V. (1988). Cigarette smoking motives: Factorial structure and gender differences in a longitudinal study. *The International Journal of the Addictions*, *23*(6), 535–544.

Marshal, M. P., Friedman, M. S., Stall, R., King, K. M., Miles, J., Gold, M. a., ... Morse, J. Q. (2008). Sexual orientation and adolescent substance use: A meta-analysis and methodological review. *Addiction*, *103*(4), 546–556. http://dx.doi.org/10.1111/j.1360-0443.2008.02149.x.

Nichter, M., Nichter, M., Lloyd-Richardson, E. E., Flaherty, B., Carkoglu, A., & Taylor, N. (2006). Gendered dimensions of smoking among college students. *Journal of Adolescent Research*, *21*(3), 215–243. http://dx.doi.org/10.1177/0743558406287400.

Schuermeyer, J., Salomonsen-Sautel, S., Price, R. K., Balan, S., Thurstone, C., Min, S. J., & Sakai, J. T. (2014). Temporal trends in marijuana attitudes, availability and use in Colorado compared to non-medical marijuana states: 2003–11. *Drug and Alcohol Dependence*, *140*, 145–155. http://dx.doi.org/10.1016/j.drugalcdep.2014.04.016.

Substance Abuse and Mental Health Services Administration (2015,). *Results from the 2014 national survey on drug use and health: Detailed tables.* (Retrieved from: http://www.samhsa.gov/data).

Suerken, C. K., Roboussin, B. A., Sutfin, E. L., Wagoner, K. G., Spangler, J., & Wolfson, M. (2015). Prevalence of marijuana use at college entry and risk factors for initiation during freshman year. *Addictive Behaviors*, *39*(1), 302–307.

Trocki, K. F., Drabble, L. a., & Midanik, L. T. (2009). Tobacco, marijuana, and sensation seeking: Comparisons across gay, lesbian, bisexual, and heterosexual groups. *Psychology of Addictive Behaviors: Journal of the Society of Psychologists in Addictive Behaviors*, *23*(4), 620–631. http://dx.doi.org/10.1037/a0017334.

Vicary, J. R., & Karshin, C. M. (2002). College alcohol abuse: A review of the problems, issues, and prevention approaches. *Journal of Primary Prevention*, *22*(3), 299–331. http://dx.doi.org/10.1023/A:1013621821924.

Volkow, N. D., Baler, R. D., Compton, W. M., & Weiss, S. R. B. (2014). Adverse health effects of marijuana use. *The New England Journal of Medicine*, *370*(23), 2219–2227. http://dx.doi.org/10.1056/NEJMra1402309.

Vrangalova, Z., & Savin-Williams, R. C. (2012). Mostly heterosexual and mostly gay/lesbian: Evidence for new sexual orientation identities. *Archives of Sexual Behavior*, *41*, 85–101.